

treated biologically. Mr. W. Leach, in a paper on wool-combers effluents, also referred to the unsatisfactory character of the purification methods at present applied to the sewage. Mr. W. B. Bottomley discussed the utilisation of the sewage sludge, and contended that the sludge should be pressed and dried, when it forms a valuable manure. Dr. Letts and Mr. R. F. Blake gave a simple and accurate method for estimating the dissolved oxygen in fresh water, sea water, sewage effluents, &c.

### SCIENTIFIC SERIALS

*American Journal of Science*, September.—The gas thermometer at high temperatures, by L. Holborn and A. L. Day. This is a further study of the nitrogen thermometer with platinum-iridium bulb, which is superior to the porcelain bulb. The correction for expansion is  $10^\circ$  at  $500^\circ$ ,  $30^\circ$  at  $1000^\circ$ , and  $40^\circ$  at  $1150^\circ$ . The authors make an elaborate comparison of the gas thermometer with the thermocouples, and determine anew the melting points of a number of metals. Those of silver and gold are  $955^\circ$  and  $1064^\circ$  respectively.—Monazite, by O. A. Derby. A single granule of the mineral, no matter how minute, can be securely identified by moistening it with sulphuric acid on a slip of glass and burning off the sulphuric acid over a spirit lamp, when the residue shows the characteristic crystallisation of cerium in radiating needles or isolated crystals of the shape of cucumber seeds.—The spectra of hydrogen and the spectrum of aqueous vapour, by J. Trowbridge. When a condenser discharge is sent through a rarefied gas confined in a glass vessel, the gas cannot be considered dry, for aqueous vapour is liberated from the glass. The four-line spectrum of hydrogen in the solar atmosphere is an evidence of aqueous vapour, and therefore of oxygen in the sun. Conclusions in regard to the temperature of the stars exhibiting hydrogen spectra are misleading if purely based upon conditions of pressure and temperature, for electric dissociation plays a determining part. X-Ray phenomena produced by a steady battery current strongly suggest an electrical theory of the origin of the sun's corona.—A new effect produced by stationary sound-waves, by B. Davis. When a small cylinder, closed at one end, is placed in the stationary sound-wave of an organ pipe, it will not only arrange itself perpendicularly to the motion of the wave, but will move across the wave in a direction perpendicular to the stream-lines. When four such cylinders are mounted in the shape of an anemometer on a needle point, they rotate while the pipe is sounded.—Some interesting developments of calcite crystals, by S. L. Penfield and W. E. Ford. The crystals described show a great diversity of habit, often on a single hand specimen, due to different methods of twinning, together with peculiarities in the development of certain crystal faces. Some peculiar cases of rhombohedral twinning are described.—Method of measuring surface tension, by J. S. Stevens. The surface tension is measured by floating an iron wire on the surface of the liquid, and suspending a piece of soft iron by it. The iron is pulled into a magnetising coil immersed in the liquid by currents which increase until the surface is broken through.

*Annalen der Physik*, No. 8.—Structure, system and magnetic behaviour of liquid crystals, and their mixture with solid ones, by O. Lehmann. The author has succeeded in proving that all the characteristics of crystallisation which the "liquid crystals" described by him do not possess, cannot logically be made part of the definition of a crystal. The only general characteristics of crystals are that they are not isotropic, and that they possess a molecular directive force which governs their shape, and the manner in which their constituent particles are deposited. The directive force is preserved by means of the surface tension, and crystals may therefore be liquid or solid, but they cannot be gaseous. Liquid crystals may be produced by depositing solid crystals on the cover glass of a microscope and gently heating them above the fusing point.—Generation of electricity in liquid air, by H. Ebert and B. A. Hoffmann. A body suspended above liquid air acquires a strong negative charge. This electrification is due to the friction of minute particles of very cold ice suspended in the air vapour. The authors constructed a kind of electrifying machine by means of a tube containing a piece of wire gauze through which the vapour of liquid air was driven.—Spectrum of radium, by C. Runge. The author has located three of Demarcay's lines with the precision necessary to distinguish them from neighbouring solar lines. The lines located have wave-lengths of  $4826\cdot14$ ,  $4682\cdot346$  and  $3814\cdot591$

respectively.—Influence of a spark-gap upon the generation of Röntgen rays, by A. Winkelmann. The maximum gaseous pressure at which X-rays can be produced may be raised by introducing a spark-gap into the circuit, the best position for it being next the cathode. Hydrogen yields X-rays at greater pressures than air or carbonic acid.—Fall of potential and dissociation in flame gases, by E. Marx. The author proves that an apparent failure of Ohm's law in flame gases is due to the fact that owing to the scarcity of ions the saturation current is soon attained.—Hall effect in flame gases, by the same author. Owing to the great speed of the ions in flame gases, and the difference in the velocities of the positive and negative ions, a Hall effect is much more appreciable in flames than in electrolytes. The author demonstrates the existence of such a Hall effect in the case of a flat Bunsen flame into which a fine spray of a solution of some alkaline salt is blown.

### SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, September 24.—M. Maurice Lévy in the chair.—Nature of the combustible gases found in the air of Paris, by M. Armand Gautier. The author has shown in previous papers that the ratio of carbon to hydrogen found by his method of combustion in dilute mixtures of methane and air is 2·4, instead of the theoretical 3. The much higher value of this ratio found in the air of Paris proves that there must be present gaseous substances richer in carbon than methane, such as benzene vapour or its analogues. The experimental results obtained are in accord with the assumption that in 100 litres of Paris air there are 19·5 c.c. of hydrogen, 12·1 c.c. of methane, 1·7 c.c. of benzene vapour and 0·2 c.c. of carbon monoxide.—Experiment in wireless telegraphy with the human body and metallic screens, by MM. E. Guarini and F. Poncelet. The electric waves were generated by a Wimshurst influence machine and were allowed to act directly upon a coherer. It was found that the human body acted perfectly as a screen.—On crystallised calcium aluminate, M. Ém. Dufau. The crystallised aluminate is obtained by heating a mixture of calcined alumina and lime in an electric furnace. Its formula is  $\text{CaAl}_2\text{O}_4$ ; it forms transparent needles which do not scratch glass.—On Russian flour, by M. Balland. Proximate analyses of three samples of Russian flour are given.

### CONTENTS.

	PAGE
A Manual of the Echinoderms. By E. A. M. . . . .	545
The Botany of Captain Cook's First Voyage. By W. Botting Hemsley, F.R.S. . . . .	547
Our Book Shelf:—	
Finn: "Fancy Water-Fowl."—R. L. . . . .	547
"Catalogue of Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum."—W. F. K. . . . .	548
Egerton: "Sir Stamford Raffles: England in the Far East" . . . . .	548
Letters to the Editor:—	
The Teaching of Mathematics.—Oliver Heaviside, F.R.S. . . . .	548
The New Senate of the University of London.—Rev. Dr. A. Irving . . . . .	549
The Peopling of Australia.—John Mathew . . . . .	549
The Preservation of Big Game in Africa. By E. N. Buxton . . . . .	550
Notes . . . . .	552
Our Astronomical Column:—	
Ephemeris for Observations of Eros . . . . .	556
The Royal Photographic Society's Exhibition . . . . .	556
The International Geological Congress. By L. Gentil . . . . .	557
Forthcoming Books of Science . . . . .	558
Mathematics at the British Association. By E. T. Whittaker . . . . .	561
Physics at the British Association. By Dr. C. H. Lees . . . . .	562
Astronomy at the British Association. By A. Fowler . . . . .	565
Chemistry at the British Association . . . . .	566
Scientific Serials . . . . .	568
Societies and Academies . . . . .	568